National Institute of Environmental Health Sciences

Determinants of tick-borne encephalitis in counties of southern Germany, 2001-2008

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Year: 2010
Journal: International Journal of Health Geographics. 9: 42

Abstract:

BACKGROUND: Tick-borne encephalitis (TBE) virus can cause severe symptoms in humans. The incidence of this vector-borne pathogen in humans is characterised by spatial and temporal heterogeneity. To explain the variation in reported human TBE cases per county in southern Germany, we designed a time-lagged, spatially-explicit model that incorporates ecological, environmental, and climatic factors. RESULTS: We fitted a logistic regression model to the annual counts of reported human TBE cases in each of 140 counties over an eight year period. The model controlled for spatial autocorrelation and unexplained temporal variation. The occurrence of human TBE was found to be positively correlated with the proportions of broad-leafed, mixed and coniferous forest cover. An index of forest fragmentation was negatively correlated with TBE incidence, suggesting that infection risk is higher in fragmented landscapes. The results contradict previous evidence regarding the relevance of a specific spring-time temperature regime for TBE epidemiology. Hunting bag data of roe deer (Capreolus capreolus) in the previous year was positively correlated with human TBE incidence, and hunting bag density of red fox (Vulpes vulpes) and red deer (Cervus elaphus) in the previous year were negatively correlated with human TBE incidence. CONCLUSIONS: Our approach suggests that a combination of landscape and climatic variables as well as host-species dynamics influence TBE infection risk in humans. The model was unable to explain some of the temporal variation, specifically the high counts in 2005 and 2006. Factors such as the exposure of humans to infected ticks and forest rodent population dynamics, for which we have no data, are likely to be explanatory factors. Such information is required to identify the determinants of TBE more reliably. Having records of TBE infection sites at a finer scale would also be necessary.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2928184

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Other Geographical Feature

Other Geographical Feature : Forest

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Germany

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Tick-borne Disease

Tick-borne Disease: Tick-borne Encephalitis

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Children, Elderly

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content